Sine based Bacterial Foraging Algorithm for a Dynamic Modelling of a Twin Rotor System

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Abstract:
This paper introduces a sine-based position update strategy into Bacterial Foraging Algorithm (BFA). In solving many optimization problems, BFA produces an acceptable accurate solution but it presents a slow convergence speed towards the global solution. On the other hand, a sine-based position update strategy from the Sine Cosine Algorithm (SCA) utilizes an elitism in its position update equation. The elitism strategy contains a promising solution that guiding search agents toward global optima with relatively a faster speed. In this proposed technique, the sine-based position update strategy is incorporated prior to the reproduction phase of the BFA. With the consideration of the advantages of the elitism, it helps the BFA to converge faster and hence acquires better accuracy of the final solution. The proposed algorithm is tested on several CEC2014 benchmark functions that have various fitness landscapes and features. For solving a real world problem, it is applied to optimize a dynamic model of a Twin Rotor System. Result of the test shows that the proposed algorithm significantly outperforms the original BFA for both convergence speed and accuracy performances. On the other hand, result of the modelling shows that the proposed algorithm acquires the dynamic model for the Twin Rotor System with a significant smaller error.

Keywords: Foraging Algorithm; Sine Cosine Algorithm; Twin Rotor System; Dynamic Modelling; System Identification.

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